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SETO MARINE BIOLOGICAL LABORATORY
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ANNOTATIONES ZOOLOGICAE JAPONENSES
Volume 24, No. 1—December 1950

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Clavularia racemosa, New Primitive Alcyonarirn Found in Japan and Formosa

With 3 Text-figures

Huzio UTINOMI

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(*Communicated by* T. KOMAI)

For many years a vast number of species have been described under the genus *Clavularia*, a well-known type of the Stolonifera. There is still, however, considerable doubt as to the natural position of some species, and as to the validity of others. As far as I am aware, only five species of *Clavularia* have hitherto been described from Japan: namely, *C. eburnea*, *C. peterseni*, *C. dispersa* (Kükenthal, 1906a), *C. sulcata* (Nutting, 1912) and *C. gotoi* (Okubo, 1929). All of them are recorded from deep waters, of from 80 to 1200 meters. The form to be described in the present paper is common in the littoral of southern Japan and Formosa. It clearly belongs to this genus, but cannot be referred to any of the described species. I propose to call it *Clavularia racemosa*, n. sp.

SPECIMEN FROM JAPAN

This alcyonarian has a thread-like, anastomosing stolon, usually more than 10 cm long, with numerous polyps arising at short intervals. It grows on the stems and leaves of the kelp *Sargassum patens* Agardh, and appears much like a moss or an ivy.

When fully expanded, the polyp is coloured chocolate brown, owing to the great quantity of zooxanthellae contained in anthocodiae and tentacles. The anthosteles and stolons are paler, being light brown drab, light purple or even whitish due to densely packed spicules. When contracted, the colony takes the colour of stolon and anthosteles. In

spirit or formalin these colours fade away and the colony becomes milky white. Some specimens in spirit are greenish white.

The *stolen* spreads over the twigs of the kelp, and appears threadlike instead of being membranous as in most species of *Clavularia*. The main branch stretches along the axis of the twig of the kelp, and fuses here and tnere with the neighboring branches by short branchlets (Fig. 1A). The base of the colony which sends out the main branches shows most profuse anatomoses, the branches forming an irregular network of fine meshes, bearing comparatively few polyps.

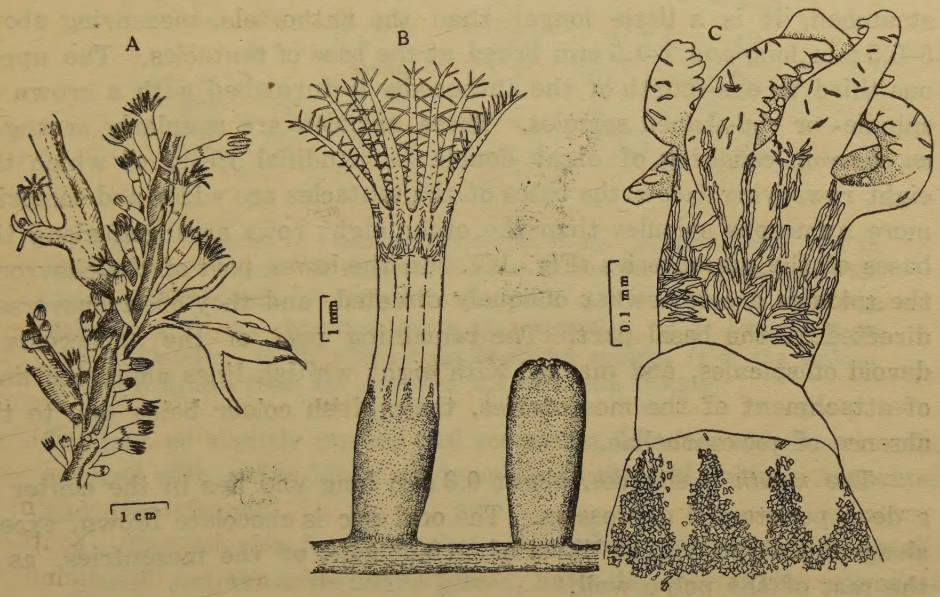

Fig. 1. Colony and polyps of *Clavularia racemosa* n. sp. A, a living colony growing on a twig of *Sargassum*. B, a fully expanded and a completely retracted polyp. C, upper part of partially expanded polyp.

The stolon is very thin throughout, about 0.4–1 mm in diameter, and almost circular or semicircular in cross section, although becoming somewhat flattened in the wider places. The points of branching are usually free from polyps.

The *polyps* are closely arranged in one row on the upper surface of the stolon, from less than 1 mm to 3 mm apart. In many cases, this distance between the neighboring polyps is much shorter in the proximal and middle parts of the colony than in the terminal part of the stolon.

The body of the polyp is distinctly divisible into a proximal densely spiculated anthostele and a distal anthocodia, the latter being completely retractile into the former (Fig. 1B). When fully expanded, the polyps are rather tall, up to 10 mm in height, excluding the tentacles. In a

completely retracted colony, the anthostele forms an elongated cone, measuring about 2–4.5 mm long and 1–1.4 mm broad.

The *anthostele* is thick-walled, opaque, and densely beset with spicules. The distal part of the spiculate region forms a chevroned feature in each intermesenteric region. Capstan-shaped spicules are irregularly arranged and massed throughout the greater part of the anthostele, but a few warty spindles may be found in the eight chevroned apices, arranged vertically.

The *anthocodia* is thin-walled, flexible, translucent, and when fully staetched, it is a little longer than the anthostele, measuring about 5–5.5 mm long and 1–1.5 mm broad at the base of tentacles. The upper one-third to one-fourth of the anthocodia is furnished with a crown of spindle- or rod-shaped spicules. These spicules are regularly arranged *en chevron*, consising of eight double longitudinal rows, of which the eight rows lying below the bases of the tentacles are wider and comprise more numerous spicules than the other eight rows arranged along the bases of the mesenteries (Fig. 1C). In the lower part of the chevrons, the tpicules are somewhat obliquely directed, and they are transversely directed in the basal part. The remaining part of the anthocodia is devoid of spicules, and marked with eight whitish lines along the lines of attachment of the mesenteries, the whitish colour being due to the absence of zooxanthellae.

The *mouth* is slit-like, about 0.3 mm long and lies in the center of a deep peristomial depression. The oral disc is chocolate brown, except along the eight whitish lines of attachment of the mesentries, as in the rest of the polyp wall.

The *tentacles* are pinnate, long, and gently taper distally. In life they appear brownish and opaque owing to the prefence of zooxanthellae. The fully stretched tentacle is about 2.5–3 mm long and 0.5 mm broad at the base. The aboral side of the rachis is furnished with a few small spicules arranged in a zigzag course, numbering 15 to 20 in a single tentacle. The pinnules are slender and finger-shaped, and there are 10 or 11 of them on each side of the tentacles. The pinnules in the middle and distal parts of the tentacle are about 0.8 mm long. They are opaque, densely packed with zooxanthellae in the endoderm and with nematocysts in the periphery, but completely devoid of spicules.

The *spiculation* is very characteristic, and unique to the genus *Clavularia*, clearly differing from that in any other described species. The spicules (Fig. 2) are all colourless, and they may be divided into the following three, or more strictly five, types:—

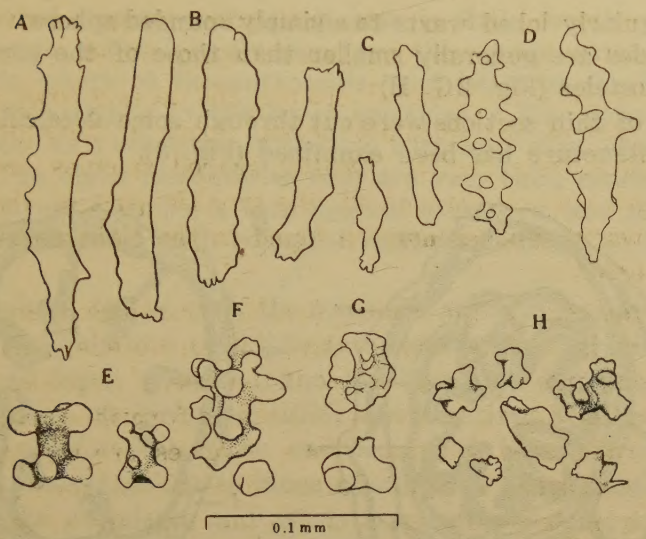

Fig. 2. Spicules of *Claavlaria racemosa* n. sp. A, anthocodial rod, on the mesenteric area. B, anthocodial rods, at the base of tentacles on the intermesenteric area. C, rodlets on the aboral side of tentacles. D, warty spindles, from the chevroned spices of anthosteles. E, F, capstans from the anthosteles. G, H, some irregular-shaped spicules from the stolons. (F and G figured from one specimen, the rest from another).

1. Straight or slightly curved and somewhat flattened spindles or rods, covered with a few blunt warts and with the ends bluntly truncated and often jagged.
   a. The spicules found on the anthocodia, both those horizontally placed and those vertically placed, have the same shape. Avergae dimensions: 0.2–0.13 mm long and 0.04–0.02 mm wide. (Fig. 2A, B)
   b. The spicules found on the tentacles are smaller and shorter, being rod-like in young polyps. Average dimensions: 0.12–0.06 mm long and 0.014–0.007 mm wide. (Fig. 2C)
2. Straight and short warty spindles or rods, rather few in number, found on the chevroned apices of the anthosteles. Average dimension: 0.1–0.05 mm long and 0.014–0.01 mm wide. (Fig. 2D)
3. Capstan-shaped or allied spicules coyered with prominent warts.
   a. Capstans with a distinct median waist and typically three, simply rounded terminal warts, somewhat like the capstans in *Alcyonium*. The greater part of the anthosteles is densely packed with this type of spicule which measures 0.fi38–0.034 mm long and 0.035 mm wide, including the warts. (Fig. 3E, F)
   b. The stolon is covered with irregular-shaped spicules, a variety of the capstans of the anthosteles, with an indistinct waist and

irregularly lobed warts to a simply rounded sphere. In size these spicules are generally smaller than those of the capstans of the anthosteles (Fig. 2G. H)

Series of thin sections were cut through some decalcified specimens and their structure has been examined (Fig. 3).

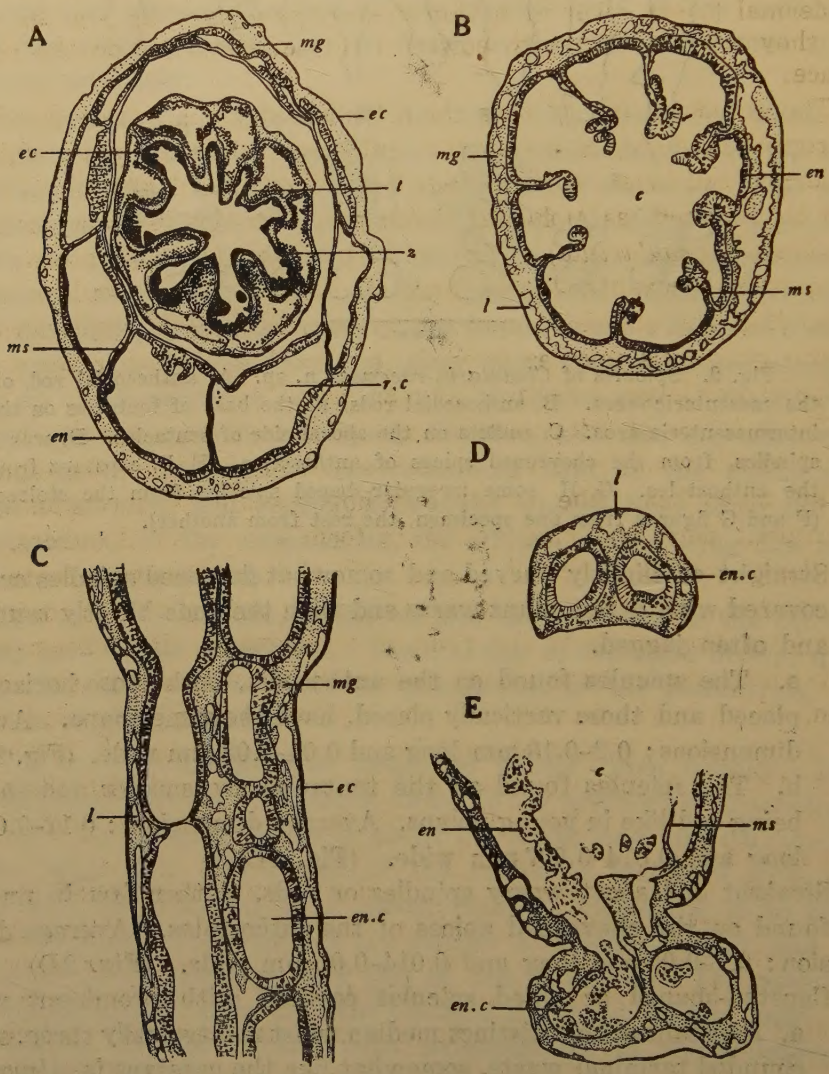

Fig. 3. Internal structure of *Clavularia racemosa* n. sp. A, transverse section of upper part of polyp. ×70. B, transverse section of middle part of polyp, showing the eight mesenterial filaments, ×70. C, horizontal section of stolon. ×80. D, transverse section of stolon. ×80. E, longitudinal section of n polyp-base connected with stolon. ×80. (*c* coelenteric cavity; *ec* ectodorm; *en. c* endodermal caual of stolon; *l* lacunae of spicules; *mg* mesogloea; *ms* mesentery; *r. c* radial chamber between mesenteries; *t* retracted tentacle; *z* zooxanthella.)

The internal structure of the polyps is little worth mentioning. The stomodaeum, which is easily seen from the outside, extends throughout the whole length of the anthocodia, and bears on the ventral side a ciliated siphonoglyphe in the lower one-third. The siphonoglyphe is lined internally by a columnar epithelium with long cilia, about 0.06 mm in height. The eight mesenteries (*ms*) are very thin, consisting of two endodermal layers covering a thin sheet of mesogloea, and in the upper part they are provided with powerful retractor muscles on the ventral surface.

The ectoderm (*ec*) of both the polyp and stolon is weakly developed, and represented only by a very thin cuticular membrane under which no ectodermal cell layer, such as found by Kükenthal (1906) in *C. chuni*, could be detected, as Molander (1920) also mentions in other species of *Clavularia* (*Cornu'ariella*). The endoderm (*en*) is comparatively thick and contains zooxanthellae in large quantities. The mesogloea (*mg*) is thicker than the endoderm and nearly homogeneous in appearance, It contains numerous spicules towards the periphery, which after decalcification shows large, irregular lacunar spaces (*l*).

The interior of the stolon is occupied by two large soleniae or endodermal canals (*en.c*) running parallel to each other; these are supported by the mesogloea. The canals are not continuous throughout, but interrnpted here and there so as to form a chain of chambers, as in *Cornularia komaii* (Utinomi, 1950). They do not communicate with one another, but each oommunicates individually with the coelenteric cavity (*c*) of the polyps at the point of attachment. In addition to the solenia there are in some places some endodermal cell strings without lumen, which might be mistaken for capillary tubes, as is also the case with other species of *Clavularia* (*Cornulariella*) (Kükenthal, 1906b; Molander, 1929). Apparently these strings never connect with the abovementioned solenia or with the coelenteron, and may be absent in the mesogloea of the polyp body (Fig. 3 C–E).

Habitat. The stoloniferan in question is commonly found growing around the surface of stems of the brown alga *Sargassum patens* Agardh and probably also of *S. serratifolium* Agardh, which occur very commonly in shallow waters of southern Japan. These algae are often inhabited by various epizoic animals, such as sedentary polychaetes (*Salmacina dysteri*, *Spirorbis foraminosus* hydroids (*Stylactis*), sponges, encrusting polyzoe, compound ascidians, sedentary foraminiferans, etc. Occasionally hollow polyps are found on the living colonies of this species, Probably the sost parts of the anthocodiae have been eaten by certain small predaceous animals. The above observation was made in Tanabe Bay near the Laboratory, which is the type locality of this new species.

SPECIMEN FROM FORMOSA

A specimen collected by myself from Kizan near Suô, on the north-eastern coast of Formosa during my trip in 1938, is also referable to the same species. The colony was found growing on the root of a green alga, *Caulerpa racemosa* var. *clavifera* Weber van Eosse. According to my field-note, it showed an uniformly brownish colour in the living condition. In spirit this colour is gone, and the animal appears white. The polyps arise perpendicularly at narorw intervals on the upper surface of the threadiike, anastomosing, cylindrical stolons. The contracted polyps the anthosteles, are about 3–5 mm long and 1–1.7 mm in diameter. This specimen shows peculiar spiculation smilar to that of the Japanese form described above.

REMARKS

This is probably the sixth species of *Clavularia* known from Japanese waters. It is quite distinctive, and though approaching most nearly in the form of stolon and in the polyp armature to C. *hicksoni* (Gohar, 1940), may be distinguished from the latter by the peculiarity of the spicules which suggests its closer relation to the Alcyoniidae.

A stoloniferan, figured under the name *Cornularia* sp. in "Illustrated Encyclopedia of the Fauna of Japan", Revised Edition (1947, p. 1563, fig. 4399) shows a very close resemblance to the present species in respect to the mode of growth of its colony. It is briefly described by Dr. Komai, as "No spicules. Coenenchyma and lower half of polyps covered with a thin chitinous cuticle (or perisarc)" which are the characteristics of the genus *Cornularia*. It is quite likely that this '*Cornularia*' is identical with the present new species of *Clavularia*.

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Notes on Some Commensal Polychaetes from Japan[1)]

With one Text-figure

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Zoological Institute, Faculty of Science, Hokkaido University
(*Communicated by* T. UCHIDA)

A considerable number of polychaetes live in association with other animals; especially the polynoids present many instances of commensalism of shown in my former report (1936). The present short notes on commensal polychaetes are based mainly on material collected by Dr. F. Utinomi of the Kyoto Imperial University. An aberrant Nereid, *Cheilonereis cyclurus*, which lives in the upper coil of whelk shells inhabited by hermit-crabs, was collected by Assist. Prof. E. Niiyama of the Hokkaido University. Of four species herein described, the Amphinomid worm fonnd commensal with a barnacle has been firstly recorded from Japan.

FAMILY AMPHINOMIDAE

Hipponoë uaudichaudi Audouin et M.-Edwards

(Figs. a–b)

H. gaudichaudi; McIntosh, 1885, p. 30, Pl. I, fig. 5; Pl. IV, fig. 3: Pl. IIIA, figs. 13–17; Fauvel, 1923, p. 132, fig. 47, l–p.

Single complete specimen measures 17 mm by 5 mm in contracted states. The body is flattened and composed of 27 setigerous segments. The head is small and somewhat ovoid in shape. From the hinder part of the posterior pair of eyes a single median subulate tentacle projects backwards as far as the posterior portion of the second setigerous segment. A pair of small lateral tentacles, about one-third the length of the median one, is situated on either side of the front of the head. The branchiae begin on the 3rd chaetiger. They are arbores.

1) Contribution No. 242 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo.

2) The writer left this world on December 26th, 1959.

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(Shirahama, Wakayama-ken, Japan)
Contribution No. 152

cent and richly branched. The dorsal bristles are finely capillate and delicately serrated distally. I can distinguish no dorsal bristles with bifid tips as shown in McIntosh's figure. The ventral bristles are short and stout with a long curved terminal hook and a sborter blunt one beneath.

Locality: Shirahama, Wakayama Pref. Collected by Dr. F. Utinomi.

Remarks: The specimen distended with ova was found living in the branchial chamber of the barnacle, *Lepas*. The species is new to the fauna of Japad.

FAMILY APHRODITIDAE

Scalisetosus levis Marenzeller

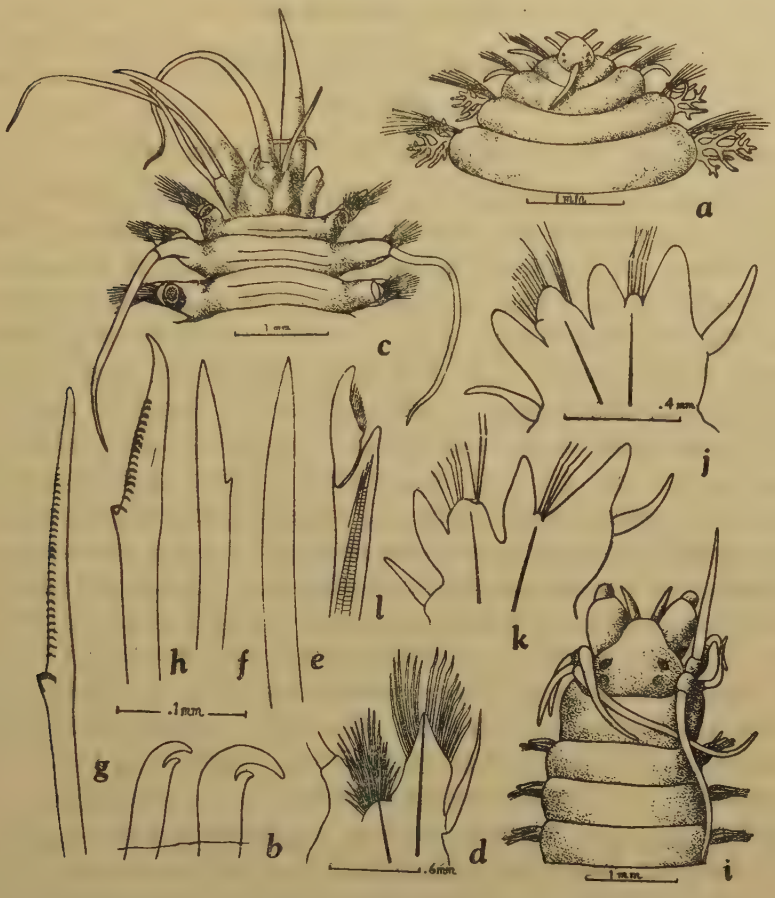
(Figs. c–g)

S. levis: Marenzeller, 1903, p. 13, Pl. III, fig. 12.

Two rather ill-preserved anterior fragments, of which only one retains any scales. Owing to the absence of the posterior part, the nnmber of the segments and elytra could not be aacertained. In general they agree well with Marenzeller's accounts except for the reduction of the eyes. The head is broader than long and divided by a median shallow gaoove. The insertion of the lateral tentacles is ventral, and the prostomial peaks are distindt. No eyes were found. The median tentaculophore is rather stout and the median tentacle is loog, tapering about five times the length of the head. The palps are smooth, about twice as long as the lateral tentacle. The tentacular cirri are slightly longer than the median tentacle. The elytra are more or less ovate and translucent with clearly outlined nerve supply, having a few short and minute cilia along the outer and posterior borders. The dorsal cirri are long, slender and tapering, while the ventral ones extend slightly beyond the neuropodial divisions. Dorsal bristles are of two kinds; those in the superior portion are short with a spur lying close to the main stem, while those of the inferior portion are strong, gently curved, being devoid of any serrations. The upper bristles of the ventral division are slender, frilled, with comb-like teeth along one edge having the tips faintly bifid; the lower bristles are unidentate, short and stout with transverse rows of fine teeth along the convex border and spinous pouch.

Locality: Shirahama, Wakayama Pref. Collected by Dr. F. Utinomi.

Remarks: The present specimens were found living in association with an Alcyonid, *Dendronephthya*. The same Alcyonid often bears an aberrant Ctenophore, *Coeloplana bocki*. A number of the representatives of the genus *Soalisetosus* occur as commensals: *S. communis* (*S. pellucidus*)



Text-fig. 1: a, anterior extremity of *Hipponoe gaudichaudi*; b, ventral bristles of the same; c, anterior portion of *Scalisetosus levis*; d, 9th foot of the same; e–f, dorsal bristles of the same; g–h, ventral bristles of the same; i, anterior portion of *Perinereis cultrifera*; j, 15th foot of the same; k, 50th foot oi the same.

lodges in the ambulacral grooves of star-fishes such as *Astropecten irregularis* and *Crossaster papposa*; *S. assimilis* is found on the body of a sea-urchin *Echinus* sp.; *S. rutilans* on *Xenia* and *S. crinoidicola* on some Crinoids.

The species has never been recorded since the original deseription of Marenzeller, by whom the species was recorded from Kagoshima, Nagasaki and Hongkong, and has been known as commensal with an Alcyonid.

FAMILY NEREIDAE

Perinereis cultrifera (Grube)

(Figs. i–j)

Perinerets cultrifera: Fauvel, 1923, p. 352, fig. 137 (for synonymies).

A single small specimen is an anterior fragment measuring 30 mm by 2.5 mm without the feet for 57 chaetigers. In spirit there is no colour. Theye is a pair of palps with rather stout palpophores and small globular styles. The tentacular cirri are rather short, the longest reaching back to the 4th chaetiger. A pair of tentacles is about equal in length to the palps. The first parapodium has single dorsal and ventral lobes of about equal length and narrow postsetal ones. In the 15th foot the dorsal setigerous division consists of only spinous homogomphs; the upper part of the ventral division contains homogomph spinigers and heterogomph falcigers, while the lower part of the same has heterogomph falcigers and a single spinous heterogomph seta. The arrangement of the paragnaths ls as follows: Group I. two in line; II. triangular cluster of 13–15 paragnaths on each side; III. transverse band of small paragnaths os about three irregular rows; IV. clusters; V. a triangular path of three paragnaths; VI. a single transverse elongated paragnath on each side; VII–VIII. continuous double rows.

Locality: Shirahama, Wakayama Pref. Collected by Dr. F. Utinomi.

Remarks: The present specimen seems to be the juvenile form and is devoid of any such pigmentation as is generally shown in the adult worm. Judging from the arrangement of the paragntths on Group I and V, the present specimen moy well be attributed to *P. cultrifera* var. *typica*. The species was found inhabiting the mantle cavitv of the pearl-oyster, *Pteria martensi*.

Cheilonereis cyclurus (Harrington)

Nereis cyclurus. Harrington, 1897, pp. 212–220, Pl. 16, figs. 1–3, Pl. 17, fiss. 1–7, Pl. 18, figs. 1–5; Ramsay, 1914, pp. 237–240; fig. 1; Johnson. 1901, p. 400, Pl. 4, fig. 46, Pl. 5, figs. 48–52.
Nereis shishidoi: Izuka, 1912, p. 177, Pl. 19, figs. 10–18; Fauvel, 1933, p. 20.
Cheilonereis cyclurus: Hartman, 1940(p. 219.

Remarks: The species found normallv in association with the hermit-crabs was first described by Harrington (1897) from Puget Sound. Afterwards Moore (1908) and Ramsay (1914) suggested the generic separation of *cyclurus* from other Nereids on account of the extraordinary development of the peristomium. In 1916 the new genus *Cheilonereis* was created by Benham, for the type species *cyclurus* and a new species

peristomialis from Avstralasian waters. The genus is mainly characterised by the peculiar shape of peristomium produced laterally and ventrally to form a collar-like lip under the prostomium. Izuka (1912) recorded *Nereis shishidoi* found in a dead gastropod shell from Japan. There seems to be very little to distinguish the Izuka species from *cyc'urus*. The structure of head and feet are very similar, and I agree with Ramsay in the opinion that the slight differences as to the number of the paragnathi of the basal ring between Harrington's and Izuka's species are insufficient for the specific distinction. The American specimens examined by Ramsay (1914) show that the paragnaths agree exactly with those of the Japanese worm. On the other hand, *Cheilonereis peristomialis* described by Renham (1916) is also evidently closely allied to the present species, and it seems to me there is no reason for regarding the Australasian species as distinct from the species found in Japanese ahd American waters.

The present specimens at my disposal agree well with *Nereis shishidoi* described by Izuka. The largest specimen measures 85 mm by 8 mm for 97 tetigeɹcus segments. The species has previously been recorded from the Paciffc coasts of America and Japan, Australia and the Yellow Sea, *Nereis fucata* and *Syllis cornuta* also ueually live in empty shells, which they share with hermit-crabs.

Locality: Oshoro, sea of Japan. Collected by Mr. E. Niiyama. Commensal with hermit-crabs.

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THE NEMATOCYSTS IN THE CTENOPHORE EUCHLORA RUBRA

Euchlora rubra (Kölliker) is known as the only ctenophore provided with nematocysts. As early as in 1856, Gegenbaur noticed the presence of nematocysts in this ctenophore. Chun (1880) also records and illustrates nematocysts in the same species in his magnificent monograph. Since then few workers, even authors of comprehensive works on Ctenophora, have mentioned this peculiarity in Euchlora. This is undoubtedly due to the extreme rarity of this ctenophore. In 1942 I had the chance of examining four specimens of this ctenophore collected at Seto in Wakayama Prefecture by Dr. T. Tokioka. On examining the sections of these specimens, I recognized numerous nematocysts in all of the specimens. The nematocysts were imbedded in the tissue of the tentacle along its lateral sides throughout the length. They were also found in the wall of the tentacular canal, on the side underlying the base of the tentacle. These nematocysts were of two kinds which might be called macro- and micronematocysts respectively. These occurred in mixture, macro- and micronematocysts roughly in proportion of 1:20–30. Thus, the occurrence in this ctenophore of the nematocysts is beyond question.

I reported this finding in two papers published in the same year. I had noticed, however, that the nematocysts were imbedded in the tissue of the tentacle, instead of being arranged on the surface of the latter. Especially, their occurrence in the wall of the tentacular canal appeared rather incomprehensible. More recently, at the suggestion of Dr. Libbie Hyman, I have become convinced that the nematocysts are of foreign origin, probably derived from some small medusae eaten by the ctenophore. This conjecture seems to clear up all the enigmas presented above.

It should be pointed out, however, that this ctenophore has no colloblast, and this feature is quite unique among tentaculate ctenophores. Possibly, this ctenophore uses its tentacles simply as balancing or floating apparatus, and captures its prey only with its large mouth. In any case, here is another case where nematocysts of foreign origin simulate their occurrence in an animal outside of the Cnidaria.

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SETO MARINE BIOLOGICAL LABORATORY
(Shirahama, Wakayama-ken, Japan)
Contribution No. 153

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PHYLLOTAXIS-LIKE ARRANGEMENT OF ORGANS AND ZOOIDS IN SOME MEDUSAE

Phyllotaxis is an order universally found in the arrangement of organs in higher plants. As far as the writer knows, no such order has ever been recognized in animals. For some years he has noticed the same order in the arrangement of organs in some medusae. For instance, the tentacles in the trachymedusa (or limnomedusa according to some authors) *Gonionemus depressum*, akin to *G. murbachii*, are of various length, and their arrangement appears quite irregular at first sight. More careful examination of specimens of various developmental stages, however, reveals a distinct order among these tentacles. The relative size of the tentacles in each quadrant shows the order of development. If this order is numerically designated, the tentacles of different sizes are arranged in each quadrant as: 1, 14, 6, 19, 11, 3, 16, 8, 13, 5, 18, 10, 2, 15, 7, 20, 12, 4, 17, 9, 1, where 1 stands for a perradial tentacle. No. 2, which should otherwise be the interradial tentacle, does not take the exact interradial position, but is shifted clockwise to some extent in the subumbrellar view. Likewise, no. 3 and no. 4, which should be the adradial tentacles, are shifted somewhat, the former anti-clockwise and the latter clockwise. The same displacement may be found in other tentacles also. All these seeming irregularities are due to the phyllotaxis-like arrangement, instead of the usual radially symmetrical arrangement, of these tentacles.

In phyllotaxis, the divergence between consecutive organs (leaves, branches, flowers, etc.), in most cases, coincides with one of the following fractional series: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{5}{13}$, $\frac{8}{21}$, $\frac{13}{21}$.... This series has its limiting value in 0.382 which corresponds with 137° 30′ 28″., if the whole circumference of the stem is taken as 360°. In this ideal case, the organs should take the arrangement just mentioned. In the case under consideration, however, the quadrant of the umbrella makes a unit, and the divergence between consecutive tentacles is $\frac{1}{4}$ of 137° 30′ 28″, namely, 34° 45′ 14″. Yet, the arrangement of the tentacles follows the same order. A new tentacle, according to the scheme, should divide the arc between the preceding tentacles into the ratio of 1 : 0.618. Actual measurements have revealed this to be 1 : 0.58–0.61.

The same order may be found in the arrangement of the ex-umbrellar tentacles of another trachymedusa, *Olindias formosa*. These tentacles are situated on various levels quite without order at first sight. More careful examination reveals that they are also in accordance with the order in phyllotaxis. This medusa also has numerous centripetal canals on the subumbrellar side, which start from the circular canal and terminate on various levels at some distance from the manubrium. The arrangement of these canals accords with the same order. The same scheme may also be found in the arrangement of tentacles of the anthomedusa *Misakia typica*, which is allied to Proboscidactyla and Willia.

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Lastly, the dactylozooids in the siphonophore *Porpita umbella* are arranged much like the tubuliform flowers of the Compositae on the head disc. Undoubtedly, the mode of arrangement of these zooids and flowers are subject to the same order.

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Edited by Dr. Tokubei Kuroda

February 25, 1951 | Scissurellidae | No. 11.

日本産クチキレエビスガヒ科

波 部 忠 重
Scissurellidae in Japan
by
Tadashige HABE

Scissurella d'Orbigny 1823 クチキレエビスガヒ屬

1823 *Scissurella* d'Orbigny, Mem. Soc. Hist. Nat. Paris, **1**, p. 340.
1856 *Schismope* Jeffreys, Ann. Mag. Nat. Hist., (2) **17**, p. 321.
Type species: *Scissurella laevigata* d'Orbigny (designated by Gray 1847).

1. *Scissurella staminea* (A. Adams) クチキレエビスガヒ

Pl. 11, figs. 1, 2.

1862 *Anatomus stamineus* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 348.
1912 *Scissurella staminea* Thiele, Syst. Conch. Cab., 2 (4a), p. 16, pl. 2, figs. 11, 12.
1924 *Scissurella turbinata* Yokoyama, Jour. Coll. Sci., Imp. Univ. Tokyo, **45** (1), pl. 5, fig. 21 (not of A. Adams 1862).

Height 1.2mm., breadth 2.0mm. (figured specimen collected from the Obama Bay in the Japan Sea).
Type locality: Tsushima (25 fathoms).
Distribution: Kyushu and Honshu.

Schizotrochus Monterosato 1877

1854 *Anatomus* H. et A. Adams, Gen. Rec. Moll., **1**, p. 439 (not of Montfort 1810).
1877 *Schizotrochus* Monterosato, Ann. Mus. Genov., **9**, p. 416.
Type species: *Scissurella crispata* Fleming (original designation).

2. *Schizotrochus japonicus* (A. Adams) ニッポンクチキレエビス

Pl. 11, fig. 9.

1862 *Anatomus japonicus* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 347.

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(Sirahama, Wakayama-ken, Japan)
Contribution No. 155

1912 *Scissurella japonica* Thiele, Syst. Conch. Cab., **2** (4a), p. 17, pl. 2, fig. 14.

Height 3.2mm., beadth 4.0mm. (examined specimen collected from Moeshima).

Type localities: Mino-Sima (63 fathoms); Seto-Uchi; Gotto and O-Sima.

Distribution: Kyushu and Honshu; Moeshima in the Kagoshima Bay, Kyushu (Pleistocene fossil).

3. *Schizotrochus soyoae* new species ソウヨウクチキレエビス

Pl. 11, figs. 3, 4.

Shell small, thin, light yellow, depressed; whorls about 4, rapidly increasing; each whorl rounded at the periphery, marking a slit or concave fasciole; the sculpture consisting of numerous, fine, radiating threads which are crossed by weaker spiral lirae; slit peripheral, long, slightly narrowing towards the aperture; fasciole peripheral, appearing from very early whorls, narrow and shallowly excavated without upturned edges; aperture rounded; outer and basal margins roundly arcuated, thin; columellar margin also arcuated and reflected over the umbilicus; umbilicus small and deep, partly covered by the dilated columellar margin.

Height 2.3mm., breadth 2.8mm. (figured type specimen).

Type locality: Off Tsugaru Peninsula, Northern Honshu (Soyo-maru Station No. 647, 86m. in depth).

Remarks: This new species may be easily distinguished from the closely allied *Schizotrochus japonicus* in the light yellowish coloration and the rounded peripheral nature with a shallow fasciole and without any upturned edges which are very remarkable in that species.

4. *Schizotrochus lamellatus* (A. Adams) コデマリクチキレエビス

Pl. 11, figs. 7, 8.

1862 *Anatomus lamellatus* A. Adms, Ann. Mag. Nat. Hist., (3) **10**, p. 347.

1912 *Scissurella lamellata* Thiele, Syst. Conch. Cab., **2** (4a), p. 16, pl. 2, fig. 13.

Height 3.8mm., breadth 3.6mm. (figured specimen collected from the Tosa Bay, Shikoku by A. Teramachi).

Type localities: Mino-Sima (63 fathoms); Gotto (71 fathoms) and O-Sima (26 fathoms).

Distribution: Sagami Bay (Soyo-maru Station No. 255, 283m. in depth) and Kumano-nada (Soyo-maru Station No. 205, 224m. in depth), Honshu; Shikoku and Kyushu.

Plate 11. Scissurellidae

Explanation of Plate 11. 第11圖版說明

Figs. 1, 2. *Scissurella staminea* (A. Adams) クチキレエビス 1.2mm.×2.0mm. p. 65.
3, 4. *Schizotrochus soyoae* n. sp. ソウヨウクチキレエビス 2.3mm.×2.8mm. p. 66.
5, 6. *Woodwardia carinata* (A. Adams) スカシエビス 1.5mm.×2.0mm. p. 68.
7, 8. *Schizotrochus lamellatus* (A. Adams) コデマリクチキレエビス 3.8mm.×3.6mm. p. 66.
9. *Schizotrochus japonicus* (A. Adams) ニッポンクチキレエビス 3.2mm.×4.0mm. p. 65.
10, 11. *Schizotrochus? concinnus* (A. Adams) p. 68
12, 13. *Schizotrochus turbinatus* (A. Adams) 2.0mm.×2.0.mm. p. 68

5. *Schizotrochus turbinatus* (A. Adams)

Pl. 11, figs. 12, 13.

1862 *Anatomus turbinatus* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 347.

1912 *Scissurella turbinata* Thiele, Syst. Conch. Cab., **2** (4a), p. 15, pl. 2, figs. 9, 10.

Height 2.0mm, breadth 2.0mm. (after Thiele 1912)

Type locality: Mino-Sima in the Japan Sea (63 fathoms).

6. *Schizotrochus? concinnus* (A. Adams)

Pl. 11, figs. 10, 11.

1862 *Anatomus concinnus* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 348.

1912 *Scissurella concinna* Thiele, Syst. Conch. Cab., **2** (4a), p. 17, pl. 2, figs. 15, 16.

No measurement of shell was given to the specimen figured by Thiele 1912

Type locality: Rifunsiri (=Rebun-tô) in the Japan Sea (35 fathoms).

Woodwardia Crosse et Fischer 1861 スカシエビスガヒ屬

1861 *Woodwardia* Crosse et Fischer, Jour. de Conchyl., **9**, p. 160.

[*Schismope* of many authors, but not of Jeffreys, 1856]

Type species: *Scissurella elegans* Woodward (monotypy)

7. *Woodwardia carinata* (A. Adams) スカシエビスガヒ

Pl. 11, figs. 5, 6.

1862 *Scissurella carinata* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 346 (not of Watson 1886).

1912 *Schismope carinata* Thiele, Syst. Conch. Cab., **2** (4a), p. 26, pl. 3, fig. 25.

Height 1.5mm., breadth 2.0mm. (figured specimen collected from the Obama Bay, in the Japan Sea).

Type localities: Okosiri (35 fathoms), Hokkaido; Seto-Uchi (16 fathoms) and Gotto (71 fathoms), Kyushu.

Distribution: Kyushu; Honshu and Hokkaido.

8. *Woodwardia modesta* (A. Adams)

1862 *Scissurella modesta* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 346.

Figure and measurement of shell were not given in the original description.

Type locality: Tabu-Sima (=Tobishima) in the Japan Sea.

9. *Woodwardia miranda* (A. Adams)

1862 *Scissurella miranda* A. Adams, Ann. Mag. Nat. Hist., (3) **10**, p. 346.

Figure and measurement of shell were not given in the original description.

Type locality: Mino-Sima (=Mishima) in the Japan Sea (63 fathoms).

Nomenclatural Notes

Two new genera are here proposed for the Japanese deep sea Pectinids. The detailed remarks on the characters shall be given in the future part of this publication.

Flavamussium new genus for *Amussium caducum* E. A. Smith, 1885, Challenger Rep., vol. 13, no. 1, p. 309, pl. 23, figs. 1—1c.

Bathyamussium new genus for *Amussium jeffreysi* E. A. Smith 1885, Challenger Rep., vol. 13, no. 1, p. 310, pl. 23, figs. 2–2c.

(Katura Oyama)

List of the marine molluscan genera, subgenera and sections (Tertiary to Recent) established by the Japanese authors (1925—1949). (No. 2).

17. *Ephippodontina* Kuroda 1945 (as a subgenus of *Ephippodonta* Tate 1889), Jap. Jour. Malac., vol. 14, nos. 1–4, pp. 41–42 (Orthotype: *Ephippodonta* (*Ephippodontina*) *murakamii* Kuroda) (Galeommatidae).
18. *Eubranchopsis* Baba 1949, Opisthobranchia of Sagami Bay, pp. 96, 173 (Orthotype *Eubranchopsis virginalis* Baba) (Eubranchidae).
*19. *Eulimotiberia* Nomura 1939 (as a subgenus of *Pyramidella* Lamarck 1799) Jubilee Publ. Comm. H. Yabe's 60th Birthday, pp. 121, 131 (Orthotype: *Pyramidella* (*Eulimotiberia*) *kamenariensis* Nomura) (Pyramidellidae).
20. *Facelinella* Baba 1949, Opisthobranchia of Sagami Bay, pp. 108, 181 (Orthotype: *Hervia quadrilineata* Baba) (Facelinidae).
*21. *Fortipecten* Yabe et Hatai 1940 (as a subgenus of *Pecten* Müller 1776), Sci. Rep. Tohoku Imp. Univ., ser. 2, vol. 21, no. 1, pp. 147–160 (Orthotype: *Pecten takahashii* Yokoyama) (Pectinidae).
22. *Habea* Kuroda 1943, Jap. Jour. Malac., vol. 13, nos. 1–4, pp. 11–14 (Haplotype: *Habea inazawai* Kuroda) (Epitoniidae).
23. *Herviella* Baba 1949, Opisthobranchia of Sagami Bay, pp. 107, 180 (Orthotype: *Cratena yatsui* Baba) (Facelinidae).
*24. *Hoonsyrnola* Nomura 1938 (it seems to be a synonym of *Nesiodostomia* Pilsbry 1918), Saito Ho-on Kai Mus. Res. Bull., no. 16, pp. 78–79 (Orthotype: *Syrnola* (*Puposyrnola*) *inturbida* (Yokoyama)) (Pyramidellidae).

25. *Hopkinsiella* Baba 1938, Jour. Depart. Agr. Kyusyu Imp. Univ., vol. 6, no. 1, pp. 9–10 (Orthotype: *Hopkinsiella hiroi* Baba) (Okeniidae).

26. *Idioteredo* Iw. Taki et Habe 1945 (as a subgenus of *Kuphus* Guettard 1770, n. n.), Jap. Jour. Malac., vol. 14, nos. 1–4, p. 115 (Orthotype: *Kuphus* (*Idioteredo*) *smithi* (Bartsch)) (Teredinidae).

27. *Ikedaella* Is. Taki et Iw. Taki 1929 (as a subgenus of *Notoplax* H. Adams 1861), Venus, vol. 1, no. 2, pp. 47–48 (Orthotype: *Notoplax* (*Ikedaella*) *conica* Is. Taki et Iw. Taki) (Cryptoplacidae).

*28. *Kaneharaia* Makiyama 1936 (as a subgenus of *Dosinia* Scopoli 1777), Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 11, no. 4, p. 213 (Orthotype: *Dosinia* (*Kaneharaia*) *kaneharai* Makiyama) (Veneridae).

29. *Kikukozara* Habe 1944 (as a subgenus of *Collisella* Dall 1871), Jap. Jour. Malac., vol. 13, nos. 5–8, pp. 173, 181 (Haplotype: *Collisella* (*Kikukozara*) *langfordi* Habe) (Acmaeidae).

30. *Kiramodulus* Kuroda 1949, Venus, vol. 15, nos. 5–8, pp. 72–75 (Haplotype: *Kiramodulus lacteus* Kuroda) (Stiliferidae).

31. *Lamellidoridella* Baba 1938 (as a subgenus of *Lamellidoris* Alder et Hancock 1885), Annot. Zool. Japon., vol. 17, no. 2, p. 130 (Haplotype: *Lamellidoris* (*Lamellidoridella*) *mitsuii* Baba) (Acanthodrididae).

32. *Marginoaostomia* Nomura 1936 (as a section of *Odostomia* Fleming 1817), Saito Ho-on Kai Mus. Res. Bull., no. 10, p. 34 (Orthotype: *Odostomia* (*Odostomia*) *suturamarginata* Nomura) (Pyramidellidae).

*33. *Meisenia* Makiyama 1936, Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 11, no. 4, p. 215 (Orthotype: *Meisenia tateiwai* Makiyama) (Veneridae).

*34. *Menesthella* Nomura 1939 (as a subgenus of *Menestho* Moeller 1842), Jubilee Publ. Comm. H. Yabe's 60th Birthday, pp. 126, 144, pl. 9, fig. 39 (Orthotype *Menestho tarukiensis* Nomura) (Pyramidellidae).

*35. *Meotolima* Oyama 1943 (as a subgenus of *Lima* Bruguière 1797), Conch. Asiatica, vol. 1, p. 36, pl. 2, figs. 9a, b, 10; pl. 14, fig. 7 (Orthotype: *Lima* (*Meotolima*) *ogasawarana* Oyama) (Limidae).

36. *Mesopholas* Iw. Taki et Habe 1945, Jap. Jour. Malac., vol. 14, nos. 1–4, pp. 109–110. (Orthotype: *Mesopholas intusgranosa* Iw. Taki et Habe) (Pholadidae).

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FROM

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THE FAUNA OF AKKESHI BAY

XVIII. ASCIDIA

BY

Takasi Tokioka

SAPPORO, JAPAN

SETO MARINE BIOLOGICAL LABORATORY
(Sirahama, Wakayamaken, Japan)
Contribution No. 156

THE FAUNA OF AKKESHI BAY

XVIII. ASCIDIA

(Contribution to Japanese Ascidian Fauna. III)

BY

Takasi Tokioka

(With 16 text-figures and Plates I and II)

Here I deal with ascidians collected by Dr. S. Okuda of the Akkeshi Marine Biological Station of the Hokkaido University in the neighbourhood of Akkeshi Bay, Hokkaido. The specimens are preserved in formalin, and comprise 17 species, of which 4 seem to be new to science. The presence of some species belonging to the genera *Perophora*, *Botryllus* and *Botrylloides* among these specimens shows us an undeniable effect of the warm current along the south-eastern coast of Hokkaido.

Before going further, I want to express my hearty thanks to Dr. S. Okuda for his kindness in giving me a chance to examine the material and to Prof. T. Komai, under whose kind guidance this study has been carried out. I also record my indebtedness to the Ministry of Education for the financial aid for pursuing the present investigation.

1. *Amaroucium glabum* Verrill 1871

(Pl. I, fig. 1)

Three colonies attached to Sargassum; the largest one is 50mm × 35mm in extent and 15mm in thickness, while the smallest one is 45mm × 32mm in extent and 9mm in thickness. Test semitransparent and pale brownish-orange in colour. System indistinct.

Zooid: Zooids seem to reach 15mm in length in life. Anterior parts of zooids are situated perpendicularly to the surface, while posterior portions are arranged rather irregularly. Postabdomen very long; and may reach more than the length of thorax and abdomen taken together. Thorax and abdomen are nearly equal in length. Branchial aperture 6-lobed; tip of atrial languet simple. Zooids flesh-coloured.

Thorax: About 13 longitudinal muscles on a side of the thorax. The number of stigmata rows 9 in many zooids, although it varies in the range of 9–12. Twelve to thirteen elongate stigmata in each row.

Dorsal languets moderately developed and displaced slightly to the left side. Tentacles consisting of ca. 5 larger and ca. 10 smaller ones. Ciliated groove a small round orifice. Anus bilobed and situated near the level of the 7th stigmata–row in individuals with 9–10 stigmata–rows, while at the level of the 9th–row in individuals with 12 stigmata–rows.

Abdomen: The posterior portion of the oesophagus is considerably swollen. Stomach near the middle of the abdomen and with 13 longitudinal plications. Mid–intestine distinct. A pair of caeca attached to the proximal end of the rectum.

Postabdomen: Ova in a zooid less than 4. The situation of the ovary can not be made out in the present material. Testicular follicles extremely minute, and arranged in many thin longitudinal rows which are then grouped into two pairs of longitudinal bands.

2. *Amaroucium constellatum* VERRILL 1871

(Pl. I, figs. 2-4)

A colony of 35mm × 35mm in extent and 15–20mm in height attached at the base of a colony of a Lafoeid hydroid. Test semitransparent and gelatinous, whitish in colour. System indistinct.

Zooid: 8–10mm in length. Postabdomen short in most zooids, although it is very long in a few zooids. Thorax and abdomen are subequal in length. Branchial aperture 6–lobed; atrial languet simple, or with 2-3 clefts. Anal opening on the level of the 7th stigmata–row.

Thorax: 10–15 stigmata in each of 11–12 rows of stigmata. Tentacles ca. 10. Embryos, up to 6, found in the brood chamber on the right side. Trunk of larvae 0.8mm in length.

Abdomen: Oesophagus not swollen. Stomach slightly in front of the middle of the abdomen and with 20–30 plications. Mid–intestine distinct. A pair of caeca at the proximal end of the rectum.

Postabdomen: Ova less than 5, and situated just behind the intestinal loop. Testis as in the preceding species.

3. *Didemnum (Didemnum) albidum* (VERRILL) 1871

(Fig. 1)

Two colonies attached to the base of a colony of a Lafoeid hydroid. One is 25mm × 10mm in extent and ca. 2mm in thickness; the

other is much smaller. They are rather poor specimens. Calcareous spicules 23–35μ in diameter; radiating processes in form of round masses. Zooid

Fig. 1. *Didemnum albidum* (Verrill)
1—Calcareous spicules, × 400; 2—Zooid, × 70.

ca. 1mm in length. Branchial aperture 6–lobed. Proximal part of vas deferens coils ca. 3 times in smaller zooids and ca. 7 times in larger zooids.

4. *Didemnum okudai* n. sp.

(Fig. 2)

About twenty small colonies on Sargassum. The largest one is 17mm × 9mm in extent and 1mm in thickness. Test transparent and milky-white in colour. Cloacal aperture indistinct. Test contains no calcareous spicule, but a small amount of fine quartz sand grains. Through the test are shown pale fleshy zooids and many bulbs, the swollen terminals of vessels being distributed densely along the margin of the colony and in the bottom layer.

Zooid: 0.9mm in length. Branchial aperture 6-lobed; atrial aperture small. A pair of fan-shaped thoracic tubercles on the thorax. Stomach longer than wide; mid-intestine distinct. Proximal part of rectum very

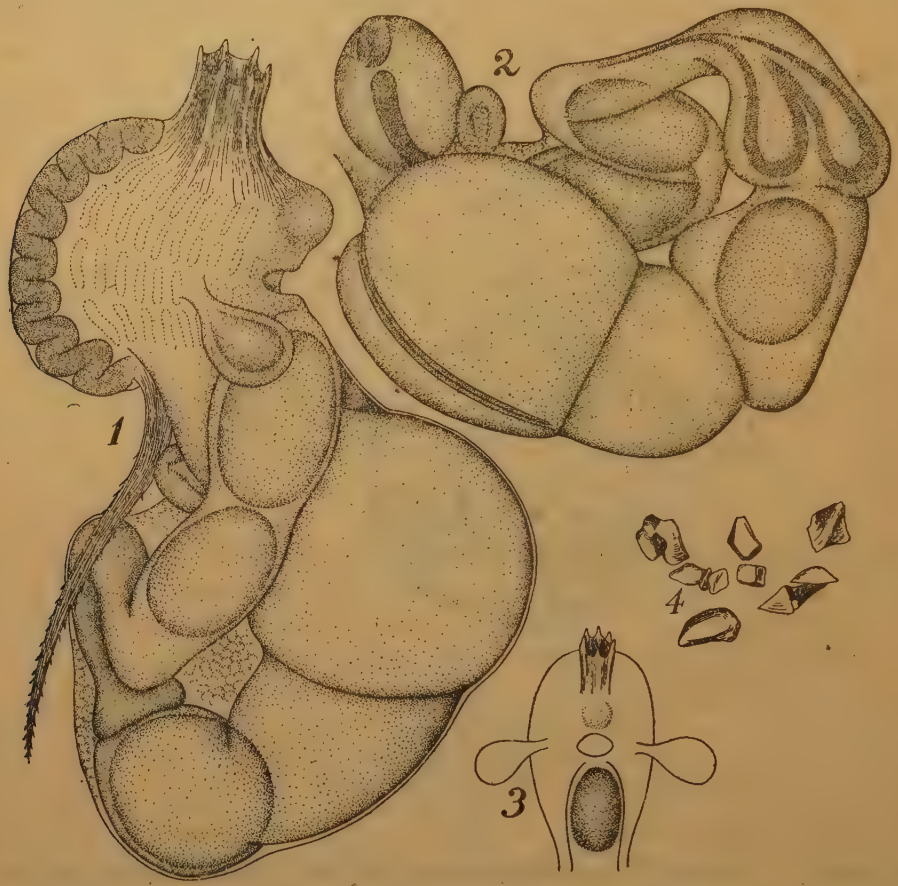


Fig. 2. *Didemnum okudai* n. sp. 1 — Zooid, × 150; 2 — Abdomen, × 150; 3 — Thorax with thoracic tubercles; 4 — Quartz sand in the test, × 150.

thick and has a whitish glandular appearance. Rectum S-shaped. Gonad not yet developed.

Remarks: The absence of calcareous spicules and the presence of a pair of conspicuous thoracic tubercles are the characteristics of this new species.

5. ***Distaplia yezoensis*** n. sp.

(Fig. 3)

Several colonies, 3–4mm in thickness, surrounding the stem of a seaweed. Test bluish gray; zooids whitish. Systems very distinct, 3–8mm in length and 2–3mm in width and consisting of 6–23, mostly ± 10 zooids.

Zooid: 2mm in length. Abdomen slightly smaller than the thorax. Branchial aperture 6-lobed. Atrial languet long; tip simple, bilobed, or rarely divided into three lobules.

Thorax: Thorax with many longitudinal muscles, but without any transverse one. Twelve to thirteen elongate stigmata in each of 4 rows of stigmata. Parastigmatic vessels present. Dorsal languets displaced to

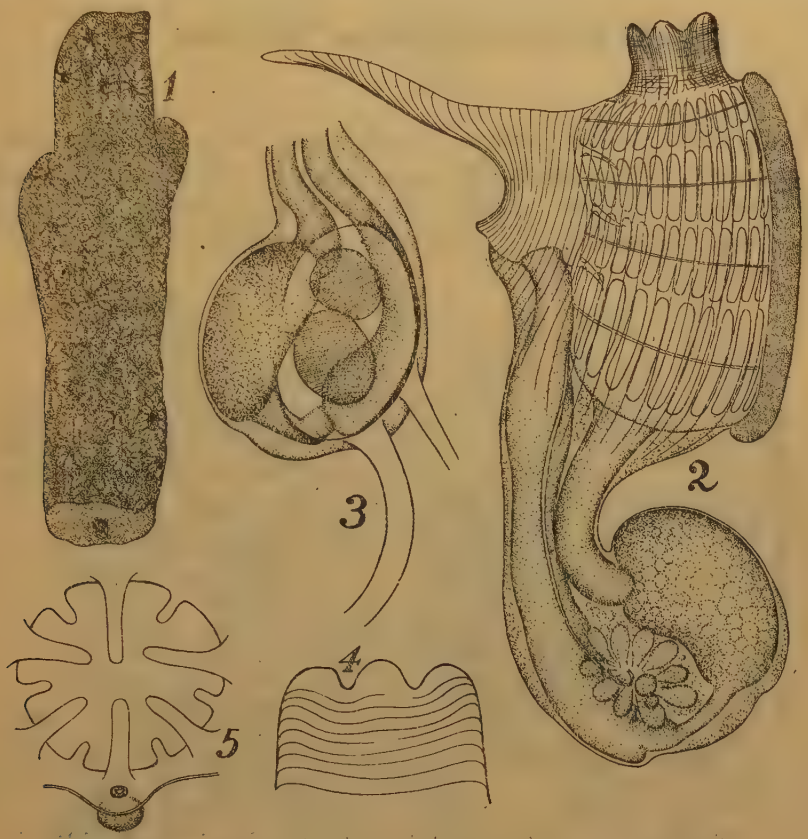


Fig. 3. *Distaplia yezoensis* n. sp. 1—A colony of 30mm long; 2—Zooid, ×50; 3—Abdomen showing pericardium, ×50; 4—Trident atrial languet; 5—Tentacles.

the left side. Tentacles 12; large and small ones alternate regularly. Ciliated groove a small oval orifice. Anus situated on the level between the 3rd and the 4th stigmata-rows, and with smooth margin.

Abdomen: Oesophagus curved so as to open horizontally into the stomach. Stomach elongate, and diminishes in size posteriorly, although it is distinctly distinguished from the following intestine. Surface of stomach smooth: though a reticular structure is faintly discernible on the inner wall. Proximal portion of rectum very thick. Gonad in the intestinal

loop. Testicular follicles less than 12; ova 2 in many zooids. A conspicuous pericardium on the opposite side of the gonad.

Remarks: Of the two known species of *Distaplia* found in the northern area of the Pacific, *D. occidentalis* Bancroft has the gonad behind the intestinal loop, while *D. clavata* (Sars) forms a characteristic club-shaped colony.

6. *Perophora japonica* OKA 1927

(Fig. 4)

Many zooids on the stem of Sargassum. Body globular and ca. 3mm in length. Test quite transparent, frequently with many fine sand grains adhering on the surface. Branchial aperture terminal; atrial aperture situated close to it. Both apertures 6-lobed.

Fig. 4. *Perophora japonica* Oka 1—A part of colony; 2—Zooid, ×16; 3—A part of the branchial sac, × 180.

Branchial sac: With 4 rows of stigmata. Eight longitudinal rows of papillae on each side. Each papilla with long anterior and posterior

processes. In one case, the anterior process of one papilla was connected with the posterior process of the corresponding papilla on the preceding transverse vessel. Ca. 25 stigmata in each row. Tentacles ca. 25, including minute ones. The anterior end of the intestinal loop reaches near the first transverse vessel. In other features the present specimens agree very well with the description given by Oka. Gonad undeveloped as yet.

7. *Botryllus primigenus* OKA 1928

(Fig. 5)

Several colonies on a laminarian leaf; the largest one 13mm × 20mm in extent and 1mm in thickness. Test transparent; zooids and vessels purplish brown; the latter form bulbs especially along the periphery of the colony. System indistinct, though partly radial as shown in the figure.

Fig. 5. *Botryllus primigenus* Oka 1—A colony; 2—Zooid; 3—Tentacles.

Zooid: Body oblique, 1mm in length. Both apertures round. Stigmata arranged in each of 4 rows as follows: D. 4-6. 4. 4-5. 5 V. Tentacles

9–12, comprising large and small ones. Ciliated groove a longitudinally oval orifice. The anterior margin of the intestinal loop reaches the middle of the third stigmata row. Ten plications on stomach.

8. *Botryllus communis* OKA 1927

(Fig. 6)

Many colonies attached to Sargassum. Smaller colonies are globular; larger ones are encrusting and may be 25mm × 10mm in extent and 2mm

Fig. 6. *Botryllus communis* Oka 1—Encrusting colony; 2—Colonies on sargasso, × 1; 3—Zooid; 4—Tentacles.

in thickness Test transparent; zooids chocolate or brownish purple in colour. System distinct and consisting usually of 5–7 zooids.

Zooid: Zooids nearly vertical and about 1mm in length. Branchial aperture round; atrial aperture opens at the tip of a siphon. Stigmata arranged in each of 4 rows as follows: D. 3–4. 3-4. 3-4. 3–4 V. Tentacles 10–14, comprising large, small and minute ones. Ciliated groove a small round orifice. Anterior margin of the intestinal loop along the level of the middle of the 4th stigmata-row. Eight plications on stomach. Anus situated on the level of the 3rd transverse vessel. Gonad not developed in any zooid.

9. *Botryllus schlosseri* (PALLAS) 1766
(Fig. 7)

Many small colonies on a laminarian leaf. They are 10mm × 10mm in extent and 1mm in thickness. Test transparent and faintly flesh in colour. System indistinct.

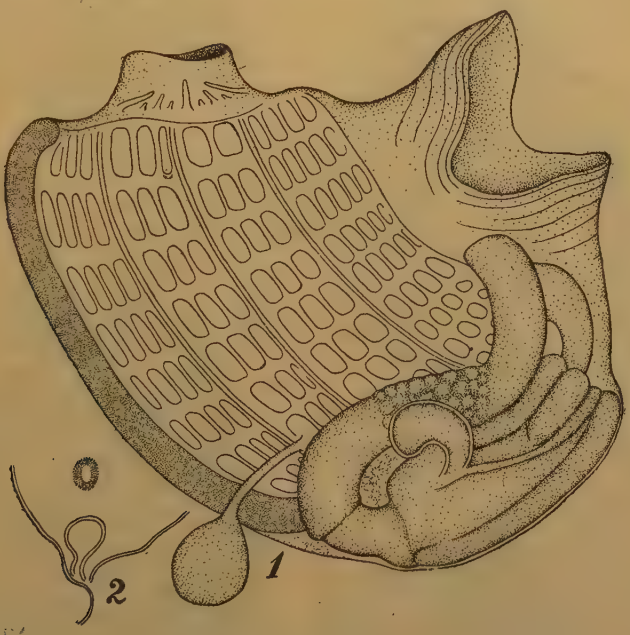


Fig. 7. *Botryllus schlosseri* (Pallas) 1—Zooid; 2— Ciliated groove. × 180.

Zooid: Zooids oblique, 1mm in length and faintly flesh in colour. Branchial aperture round; atrial aperture large. Stigmata row varies from 6 to 10, usually 8–9. Stigmata in each row 12–15 and arranged as D. 4–5. 2–3. 2-3. 4 V. Tentacles 12–16. Stomach situated behind the branchial sac and provided with 11 plications on the surface. Anus opens on the level between the 6th and the 7th stigmata-rows. Gonad can not be seen in any zooid.

Remarks: Oka (1931) stated in his description on *Myxobotrus japonicus*, that Japanese species of *Botryllus* are divided into two groups, one with 4 rows of stigmata and the other with 9 rows of them. There has been found, however, no description in his papers on the group with 9 stigmata rows. The present species is probably a representative of this group just mentioned.

10. *Botrylloides violaceum* OKA 1927

(Fig. 8)

Two colonies attached to Sargassum. They are 40mm × 20mm in extent and 5mm in thickness. Two other colonies attached on a laminarian root, are 50mm × 30mm in extent and 3mm in thickness. Test soft and transparent; faintly pinkish in colour. Zooids vertical, 1.5mm–2mm in length and pinkish or flesh in colour. Number of stigmata rows

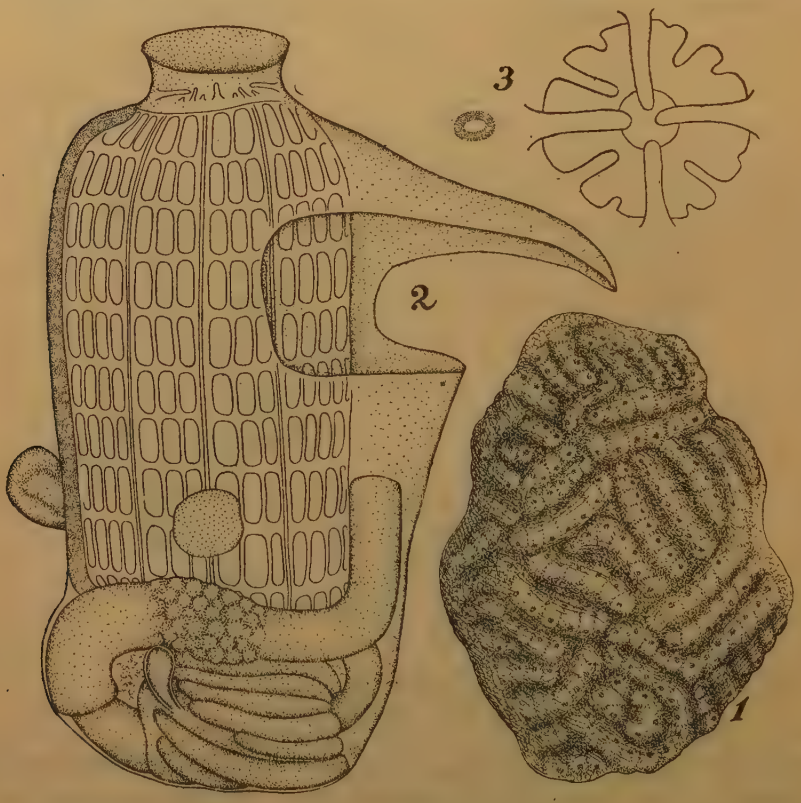


Fig. 8. *Botrylloides violaceum* Oka 1—Colony; 2—Zooid; 3—Tentacles.

varies in the range of 11–13, usually 11 on the right and 12 on the left side; the posterior three rows are covered by alimentary canal on

the left side. Stigmata arranged in each row as: D. 4–5. 2–3. 2–3. 3–4 V. Stomach with 12 (rarely 13) plications on surface. Intestine is slightly swollen in front of the stomach. This portion is the excretory glandular tissue and reddish orange in colour. The situation of the anus varies from the 7th to the 9th stigmata-row. Gonad not fully developed; only two testicular follicles found in front of the alimentary canal.

11. *Polyzoa vesiculiphora* n. sp.

(Fig. 9; Pl. II, figs 1-2)

Many specimens attached on a Lafoeid hydroid, bryozoa and egg capsules of a certain gastropod. Body 3-5mm in length, globular, with

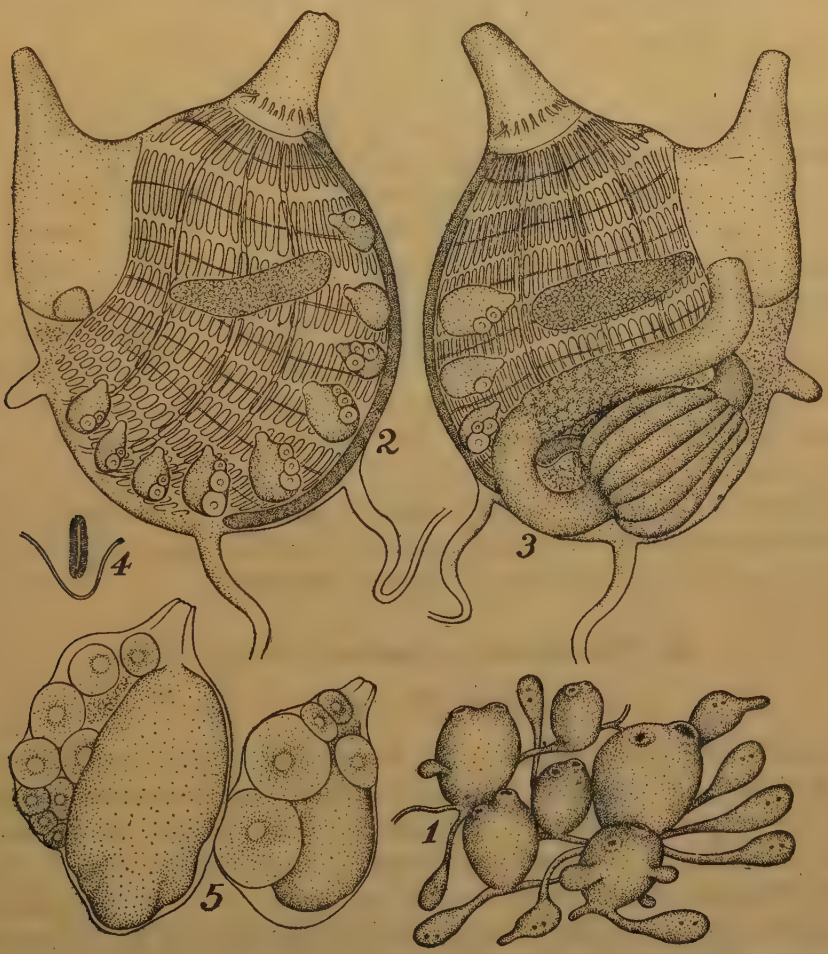


Fig. 9. *Polyzoa vesiculiphora* n. sp. 1—A part of colony; 2— Zooid from right side; 3—Zooid from left side; 4—Ciliated groove; 5—Gonad, ×70.

several knobs on the surface in some individuals. The ascidian is attached to the substratum by its postero-sinistral part of the body. Branchial aperture terminal and 4-lobed; atrial aperture situated close to it and round. Test whitish and semitransparent, frequently with fine sand grains adhering on the surface. Mantle faintly flesh in colour and provided with some processes corresponding to knobs on the test. An elongate vesicle is found near the centre of the inner surface on each side.

Branchial sac: Nine to ten rows of stigmata are present. Stigmata very slender, and arranged between three longitudinal vessels as follows:

Small individuals

D. 3. 3-4. 3-4. 6-8 V.

Large individuals

D. 6-7. 7-9. 7-9. 10-15 V.

Parastigmatic vessels present in large specimens. Dorsal lamina a plain membrane. Tentacles ca. 20. Ciliated groove a short longitudinal slit.

Alimentary system: The frontal margin of the intestinal loop reaches anteriorly the 5th transverse vessel. Stomach with 13 plications and a conspicuous pyloric coecum. Anus situated near the level of the 5th stigmata-row and plainly margined.

Gonad: Three to five on the left and 6–9 on the right side. Each gonad with a large testicular follicle. Embryos, up to 35 including immature ones, found in the atrium. Trunk of larva 0.5mm in length and with 8 ampullae in the anterior part behind the three conical attachment processes.

Remarks: This new species closely resembles *P. translucida* Ritter & Forsyth which has, however, no vesicle on the inner surface of the mantle, and is provided with 12 rows of stigmata.

12. *Dendrodoa aggregata* RATHKE 1806

(Fig. 10; Pl. II, fig. 3)

Many specimens attached to the bark of wood immersed in the sea. Large individuals measure 14–16mm in length. Body ovate and attached by the posterior end. Both apertures terminal. Test grayish white; many longitudinal and transverse grooves divide the surface into many small quadrates. Mantle thin, but strong, brownish in colour and with a orange tint around the apertures. Atrial tentacles 30–35. A few endocarps exist on the inner surface of the mantle. Many small tentacle-like processes are found on the inner surface of the mantle and also on the surface of the branchial sac, around the opening of the gonad.

Branchial sac: Intermediate longitudinal vessels entirely missing. Vessels on folds are arranged as follows:

left D. 0 (7-8) 0 (2) 0 (4) 0 (2) 0 V.
right D. 0 (6-7) 0 (2-2+*) 0 (4-5*) 0 (2-4*) 0 V.
(* in the anterior part of the branchial sac in rare cases)

Transverse vessels arranged in the following scheme: -- large-small-medium-small-large - - -. Parastigmatic vessels present in some parts of the branchial sac. Stigmata elongate and very numerous, reaching 25

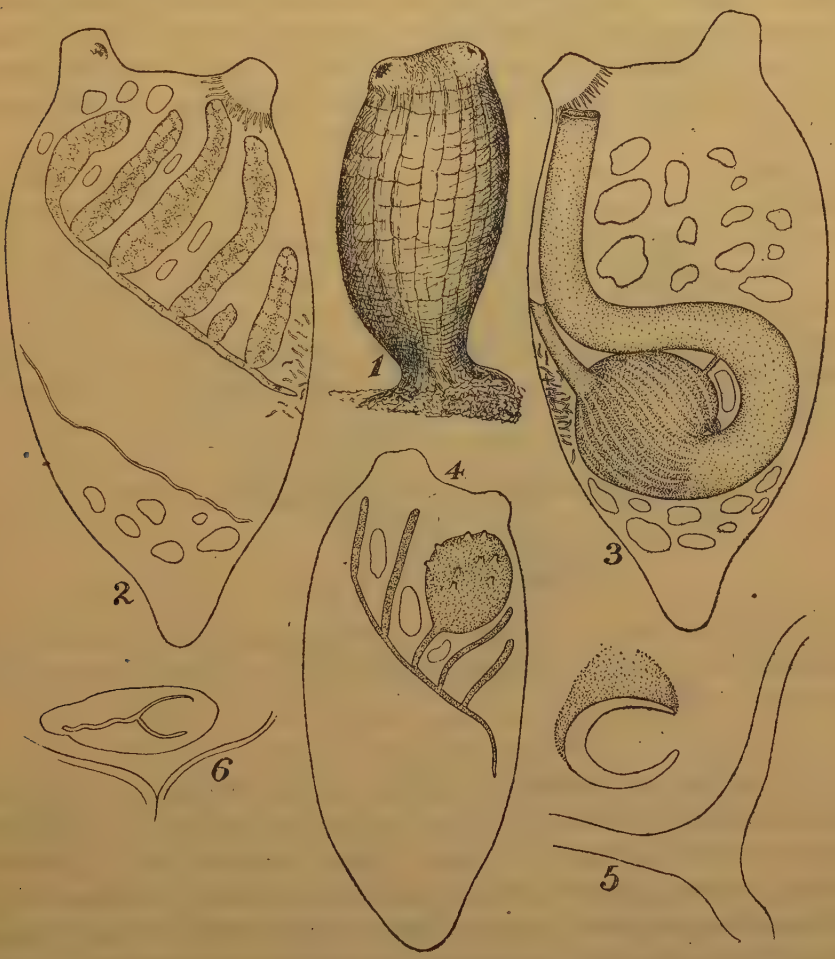


Fig. 10. *Dendrodoa aggregata* (Rathke) 1 — Entire animal, ×3; 2 — Right half from inside; 3 — Left half from inside; 4 — Right half from inside, with abnormally swollen gonad; 5 & 6 — Dorsal tubercles, ×70.

in number, in the space between the endostyle and the IVth fold. Tentacles 30–35, comprising large and small ones. Some tentacles may be bifurcated. Ciliated groove U- or Y-shaped, with the opening facing to the right.

Alimentary system: Stomach round, with 10–15 plications on the surface and a small pyloric coecum. A thin vessel bridges the space between the pyloric portion of the stomach and the intestine. Anus plainly margined.

Gonad: Gonad present on the right side only. Divided into 5–6 branches; genital aperture on the level near the middle of the body. In one specimen, one of the branches of the gonad is considerably swollen as shown in the figure. Larva with a long tail and a trunk 0.2mm in length, and with ca. 15 finger-shaped buds of the vessel in the anterior part.

Remarks: The present specimens show an intermediate state between *D. aggregata* and *D. lineata* (Traustedt). The small body and the fewer longitudinal vessels are the features resembling *D. lineata*, while the external appearance of the test and the number of tentacles are the same as in *D. aggregata*. The decrease in body size and in the number of vessels may be found as a local or a racial variation. I prefer, therefore, to treat the present specimens as a minor form of *D. aggregata*.

13. ***Syndendrodoa composita*** n. g., n. sp.

(Fig. 11)

Syndendrodoa: n. g.

Many individuals aggregated very compactly, with their tests fused completely one another forming a common test. The structure of each individual as in *Dendrodoa*.

Two colonies, of which one attached around the stem of sargassum and the other on the shell of a gastropod, *Fusitriton oregonensis* (Redfield). The colony on the shell is 100mm × 50mm in extent and 40–50mm in thickness, the other one around the stem of a sea-weed is 60mm in length and 45mm in diameter. Common test grayish violet to black, leathery and very tough. Surface with many prominences on which the apertures of zooids are found. Zooids 20mm long and 8mm wide. Mantle, alimentary canal and branchial sac purplish black in colour. Several endocarps on the inner surface of the mantle. Atrial tentacles present. Both apertures terminal and 4-lobed.

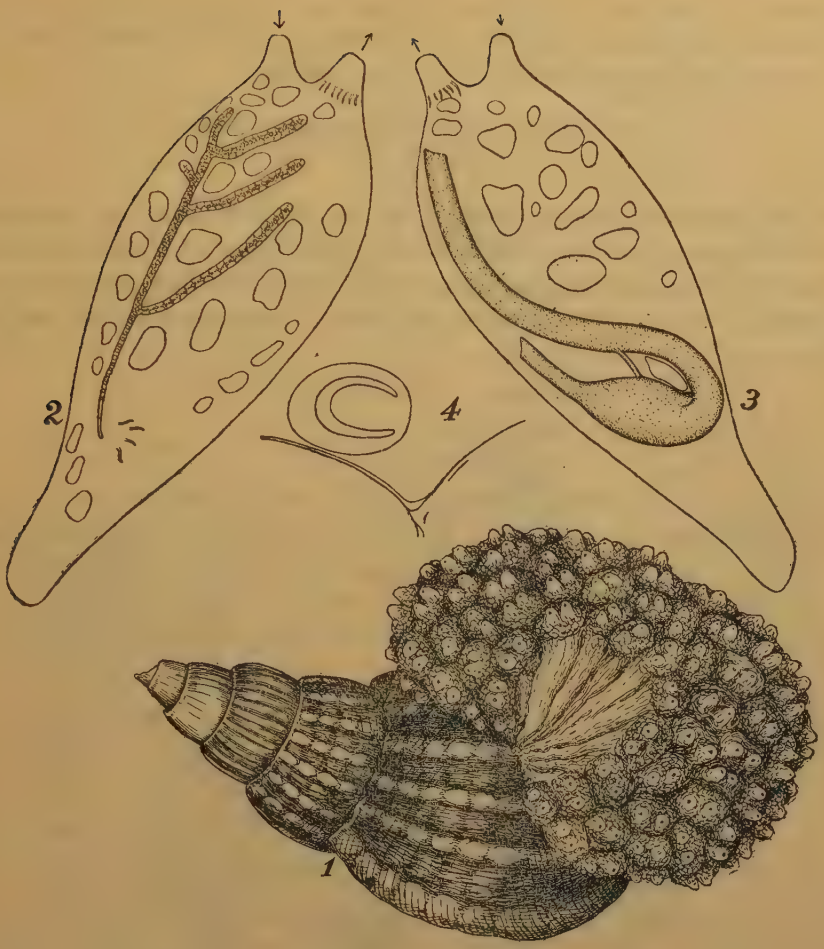


Fig. 11. *Syndendrodoa composita* n. g., n. sp.
1 — Entire colony; 2 — Zooid, right half from inside;
3 — Left half from inside; 4 — Dorsal tubercle.

Branchial sac: Longitudinal vessels arranged as follows:

left	D.	0 (7-8) 1 (1) 0 (2) 0-1 (1-2) 0 V.
right	D.	0 (7) 1 (1) 0 (3) 0-1 (1-2) 0 V.

Transverse vessels arranged in the scheme: – – – large–small–medium–small–large – – –. Parastigmatic vessels present in many places. Stigmata elongate; they may reach 25 in number in the space between the first fold and the dorsal lamina which is a plain membrane. Tentacles ca. 30. Ciliated groove U-shaped with its opening facing to the right.

Alimentary system: As in the preceding species except that the stomach has no plication or striation on its surface.

Gonad: Found only on the right side and consisting of 2-5 branches Genital opening situated in the posterior portion of the body. A few tentacle–like prominences around the opening.

14. *Styela clava* HERDMAN 1881

(Fig. 12)

Many specimens, up to 100mm in length including the peduncles which may occupy nearly a half of the body length. As this species is described fully by previous authors, I record here only the structure of the branchial sac and the number of gonads. Arrangement of longitudinal vessels :

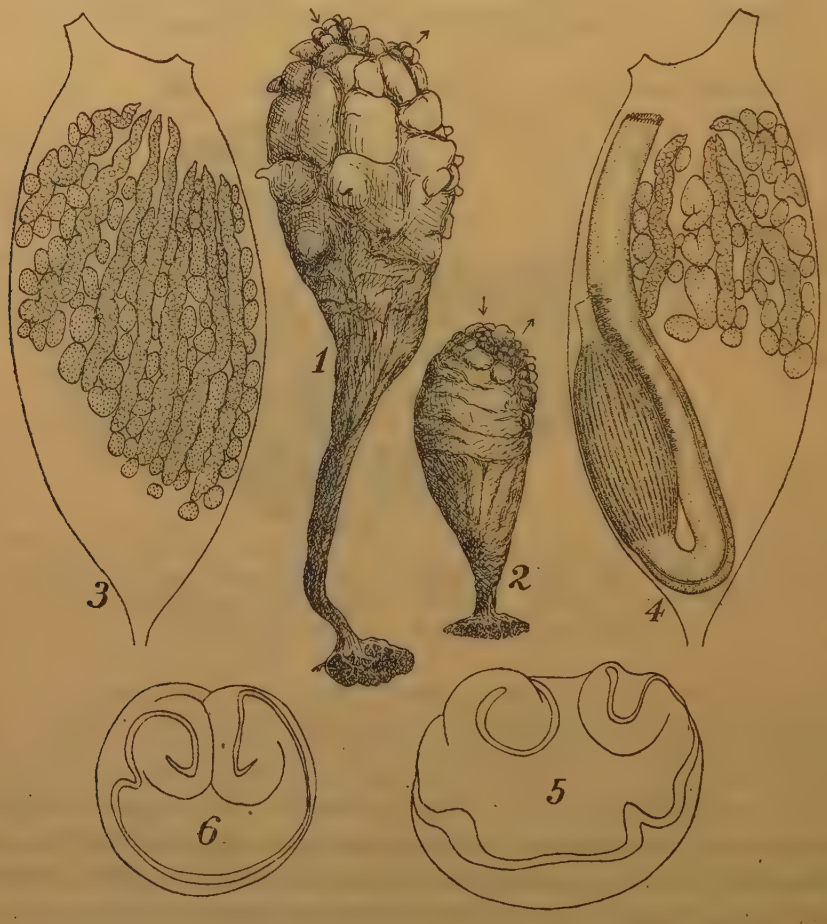


Fig. 12 *Styela clava* Herdman 1 & 2 — Entire animals; 3 — Right half from inside; 4 — Left haft from inside; 5 & 6 — Dorsal tubercles.

Large specimen
left D. 6 (27) 10 (24) 7 (29) 7 (18) 3 V.
right D. 3 (31) 8 (20) 10 (21) 12 (15) 4 V.
Small specimen
left D. 4 (24) 6 (19) 5 (23) 6 (10) 3 V.
right D. 4 (17) 8 (18) 8 (18) 7 (12) 5 V.

There is a vesselless area on the right side along the dorsal lamina near the oesophageal opening. 5–10 thinner transverse vessels between each pair of thicker ones. Six to ten elongate stigmata in a mesh. Gonads 5–7 on the right, 3–4 on the left.

15. *Boltenia echinata* (LINNAEUS) 1767

(Pl. II, fig. 4)

Three specimens, 10mm × 8mm in extent and 6-8mm in height. Both apertures 4–lobed. Longitudinal vessels arranged in the central portion of the branchial sac as follows:
D. 0-2 (9-15) 1-2 (6-8) 1-2 (10-13) 1-2 (14-15) 2-3 (11-12) 1-2 (6-8) 1-2 V.
Branches of tentacles in 3 orders.

16. *Halocynthia aurantium* (PALLAS) 1787

(Fig. 13)

Many specimens, up to 60mm in length.
Branchial sac: Longitudinal vessels arranged as follows:

Specimen 1 (60mm long) 10 folds on the left, 9 folds on the right side.
left D. 2 (13) 2 (19) 3 (25) 3 (27) 2 (28) 4 (24) 4 (20) 3 (17) 3 (16) 2 (4) 1 V.
right D. 0 (16) 2 (23) 2 (25) 2 (25) 2 (25) 3 (22) 3 (24) 2 (18) 0 (6) 0 V.
Specimen 2 (45mm long) 10 folds on each side.
left D. 2 (8) 2 (19) 2 (23) 2 (19) 3 (20) 3 (13) 4 (14) 3 (13) 3 (9) 2 (4) 1 V.
right D. 1 (13) 2 (22) 2 (22) 2 (23) 3 (23) 3 (19) 2 (20) 3 (15) 3 (14) 2 (6) 1 V.
Specimen 3 (11mm long) 8 folds on each side.

Three thinner transverse vessels between each pair of thicker ones. Parastigmatic vessels present and arranged regularly. Ten to twelve elongate stigmata in a mesh. Tentacles 16–29, comprising large and small ones alternating rather regularly; branches in 3 orders. Ciliated groove U-shaped in the 11mm long individual, while it is a rosette in grown individuals.

Fig. 13. *Halocynthia aurantium* (Pallas) 1 — Entire animal; 2 — Spinules on the test, × 70; 3 — A spine from the anterior portion, × 180; 4 — Right half from inside; 5 — Left half from inside; 6 & 7 — Dorsal tubercles, 6, 11mm long individual, 7, 60mm long individual.

Alimentary system: Liver consists of an anterior portion with longitudinal plications and a posterior portion consisting of many lobules. Margin of anus with fine lobules.

Gonad:	Specimen 1 (60mm long)	left — 1, right — 4.
	Specimen 2 (45mm long)	left — 1, right — 2.
	Specimen 3 (11mm long)	not yet developed.

17. *Molgula redikorzevi* OKA 1914

(Figs. 14 and 15)

Many specimens attached to a bryozoan, with a peduncle which is as long as body. The attachment is by the tip and the left side of the peduncle. Large ones 40-45mm in length including peduncle. Body oval, apertures terminal, and situated considerably apart from each other; branchial aperture 5-6 lobed, atrial aperture 4-lobed. Test white and semitransparent, somewhat wrinkled in the anterior portion, especially around the apertures. Mantle thin, pale flesh in colour and with feeble musculature.

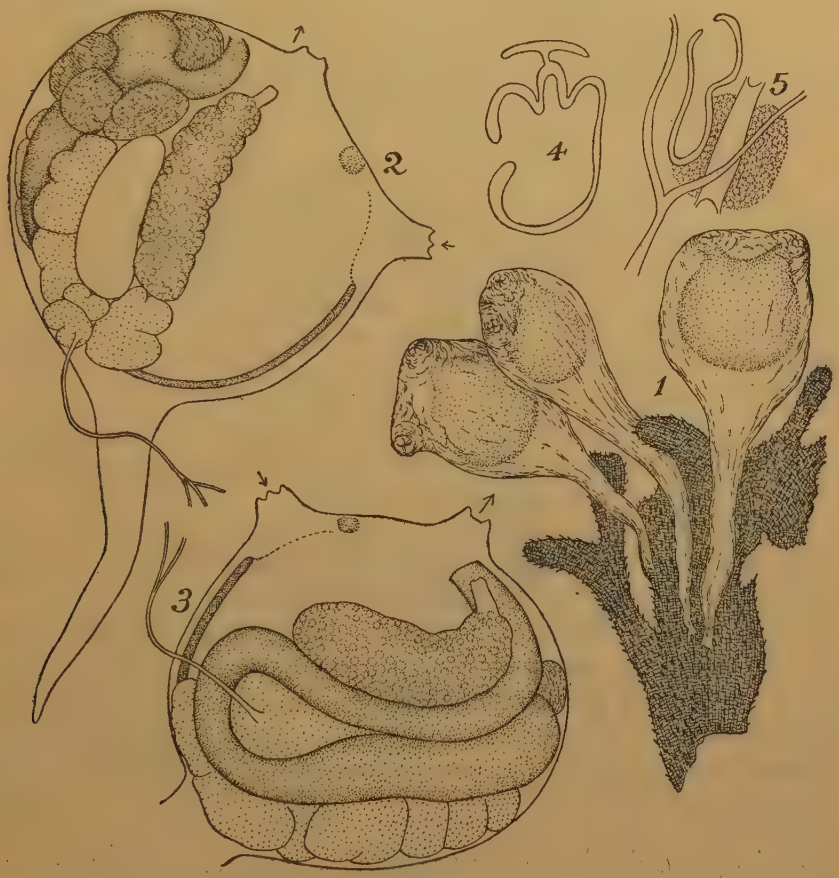


Fig. 14. *Molgula redikorzevi* Oka 1 — Three animals on bryozoa; 2 — Right half from outside; 3 — Left half from outside; 4 & 5 — Ciliated grooves.

Branchial sac: Five folds on each side. Longitudinal vessel exclusively on the upper side of each fold.

left D. 0 (4) 0 (4) 0 (4) 0 (4) 0 (3) 0 V.
right D. 0 (5) 0 (5) 0 (5) 0 (5) 0 (4) 0 V.

Eight transverse rows of infundibula are present. They are arranged in 6 longitudinal rows, one row under each fold, except the ventral-most one which is situated in the space between the endostyle and the Vth fold, and consisting of incompletely developed infundibula. Tentacles very large; ca. 20 in number, excluding minute ones; branches in 3 orders. Ciliated groove traces a rather complexly curved course.

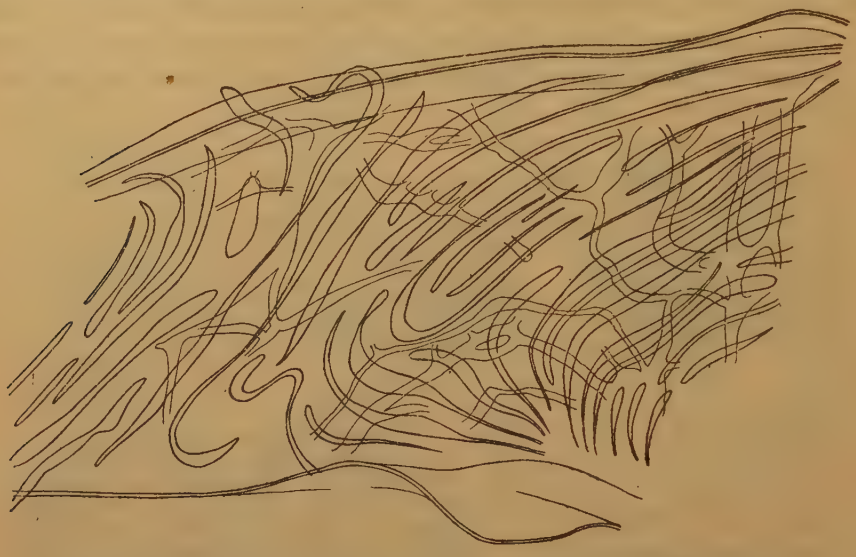


Fig. 15. *Molgula redikorzevi* Oka A part of the branchial Sac between the folds, ×42.

Alimentary system: Arrangement of the alimentary canal as shown in the figure. Liver whitish. Anus plainly margined.

Gonad: Gonad pinkish to pinkish orange. Ovary along the anterior side of the excretory organ on the right side, along the anterior margin of the intestine on the left side. Testis along the ventro-posterior side of the excretory organ on the right side, in the intestinal loop and along the posterior margin of the alimentary canal on the lest side.

APPENDIX

(I)

The followings are the notes on some ascidians found on a laminarian leaf, 600mm long × 80mm wide, which was found in the autumn of 1936 near Otaru on the western coast of Hokkaido and preserved in formalin by Mr. S. Takehara of the Otaru Commercial School. I express here my thanks to Prof. D. Miyadi who offered me this material.

Ascidians found here belong to the following 4 species.

1. *Leptoclinum takeharai* n. sp.
2. *Distaplia yezoensis* Tokioka (p. 4)
3. *Perophora japonica* Oka (p. 6)
4. *Botryllus schlosseri* (Pallas) (p. 9)

Leptoclinum takeharai n. sp.

(Fig. 16)

Three colonies, each about 15mm × 25mm in extent, and 1–2mm in thickness. Test extremely soft and quite transparent.

Zooid: 1.5mm in length and flesh in colour, with a few brownish purple pigment spots along the vessels of the branchial sac. Branchial aperture 6-lobed. Atrial aperture a huge opening.

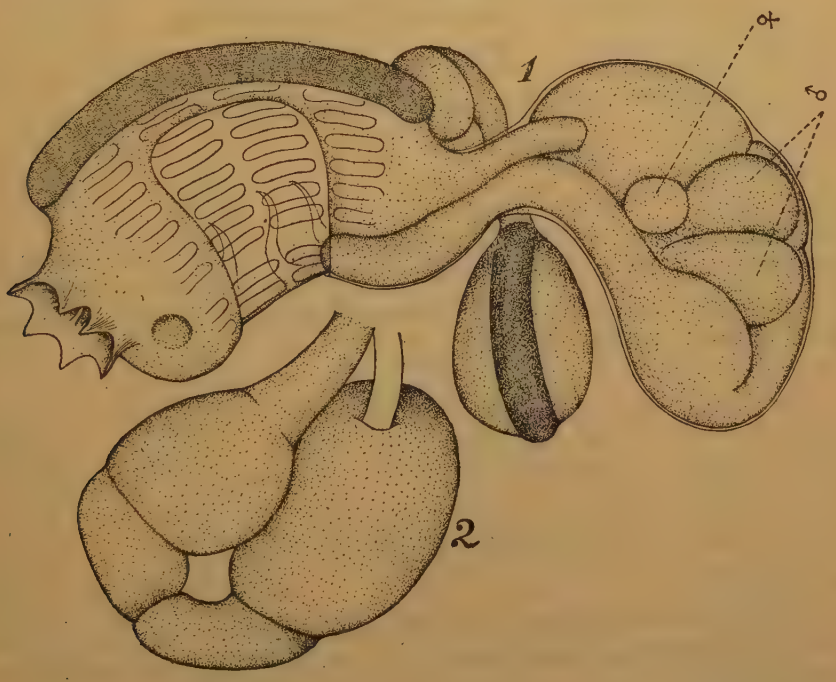


Fig. 16. *Leptoclinum takeharai* n. sp. 1 — Zooid, × 70; 2 — Abdomen, × 70.

Branchial sac: About 8 elongate stigmata in each of 4 rows. Dorsal languets long. Tentacles 12, comprising large and small ones alternating somewhat regularly.

Alimentary system: Alimentary canal does not form a loop on the horizontal plane, but assumes the appearance shown commonly in the

species belonging to *Didemnum*. Stomach longer than wide; mid-intestine distinct. The proximal portion of the rectum is considerably swollen.

Gonad: Two testicular follicles are present.

Remarks: (1) The loop of the alimentary canal is not on the horizontal plane. (2) Proximal portion of the rectum forms a remarkable bulb. These features are the most remarkable characteristics of this new species.

Distaplia yezoensis TOKIOKA 1951

Several small encrusting colonies are found in the material. They are flesh in colour and ca. 2mm in thickness. Test semitransparent.

Botryllus schlosseri (PALLAS) 1766

Several colonies, fleshy red in colour. Test transparent. Testis is not yet fully matured and consisting of only 3–4 follicles.

(II)

Dr. Isao Taki gave me a specimen of *Chelyosoma* found at the station 69°58' N × 175°14' W on 30/VII, 1937. This specimen is identified as *Chelyosoma macleayanus* Broderip & Sowerby 1830. It is 36mm × 22mm in size and 8mm in height (Pl. II, fig. 5).

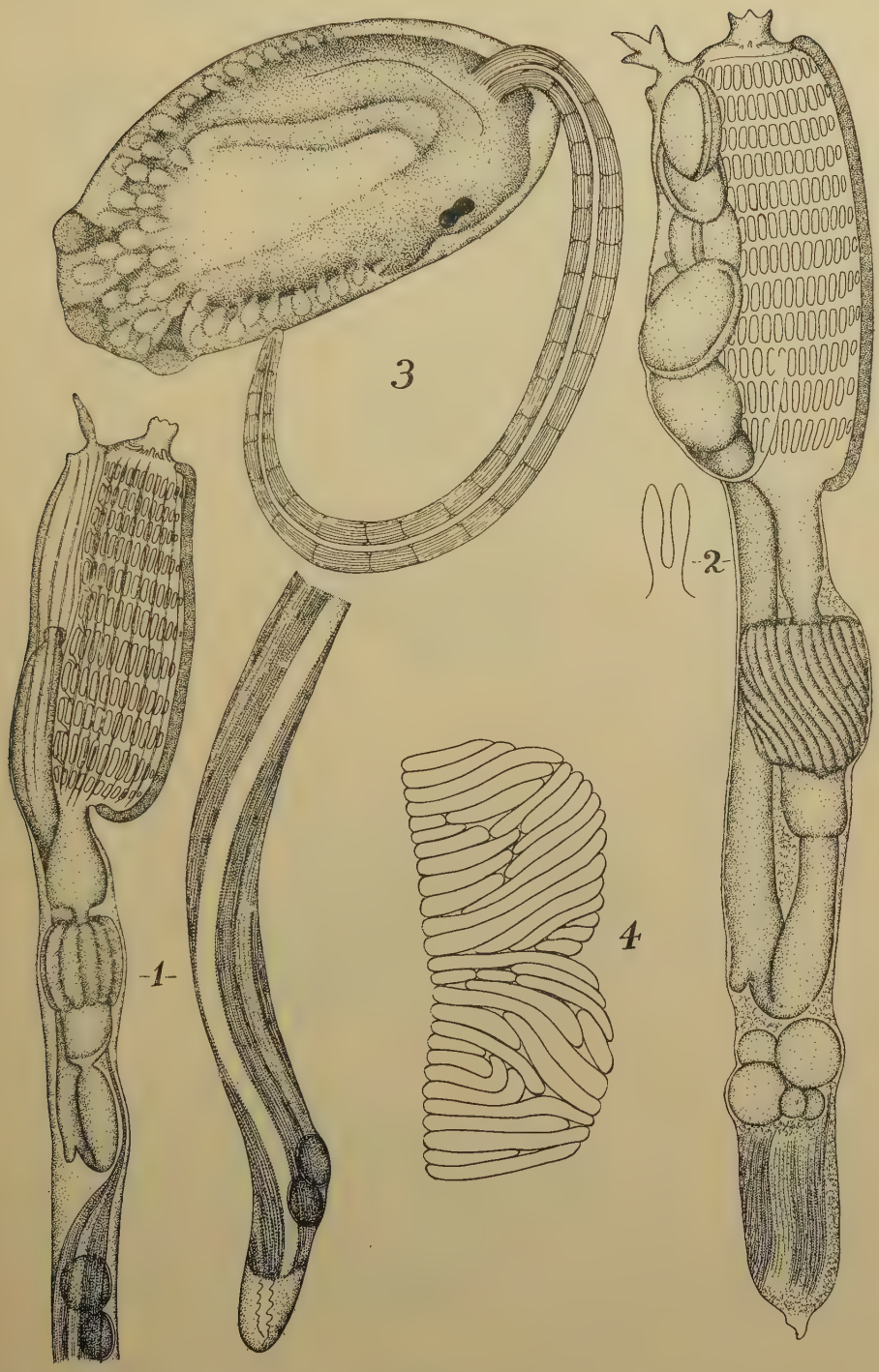
EXPLANATION OF PLATES

Plate I

Fig. 1 — *Amaroucium glabrum* Verrill; zooid, × 22.
Fig. 2 — *Amaroucium constellatum* Verrill; zooid and bifurcated atrial languet.
Fig. 3 — " " " ; larva, × 100.
Fig. 4 — " " " ; surface of the stomach.

Plate II

Fig. 1 — *Polyzoa vesiculiphora* n. sp.; larva, × 80.
Fig. 2 — " " " ; trunk of larva, × 110.
Fig. 3 — *Dendrodoa aggregata* (Rathke); larva (× 80) and a part of its test (× 200).
Fig. 4 — *Boltenia echinata* (Linnaeus)
Fig. 5 — *Chelyosoma macleayanus* Broderip & Sowerby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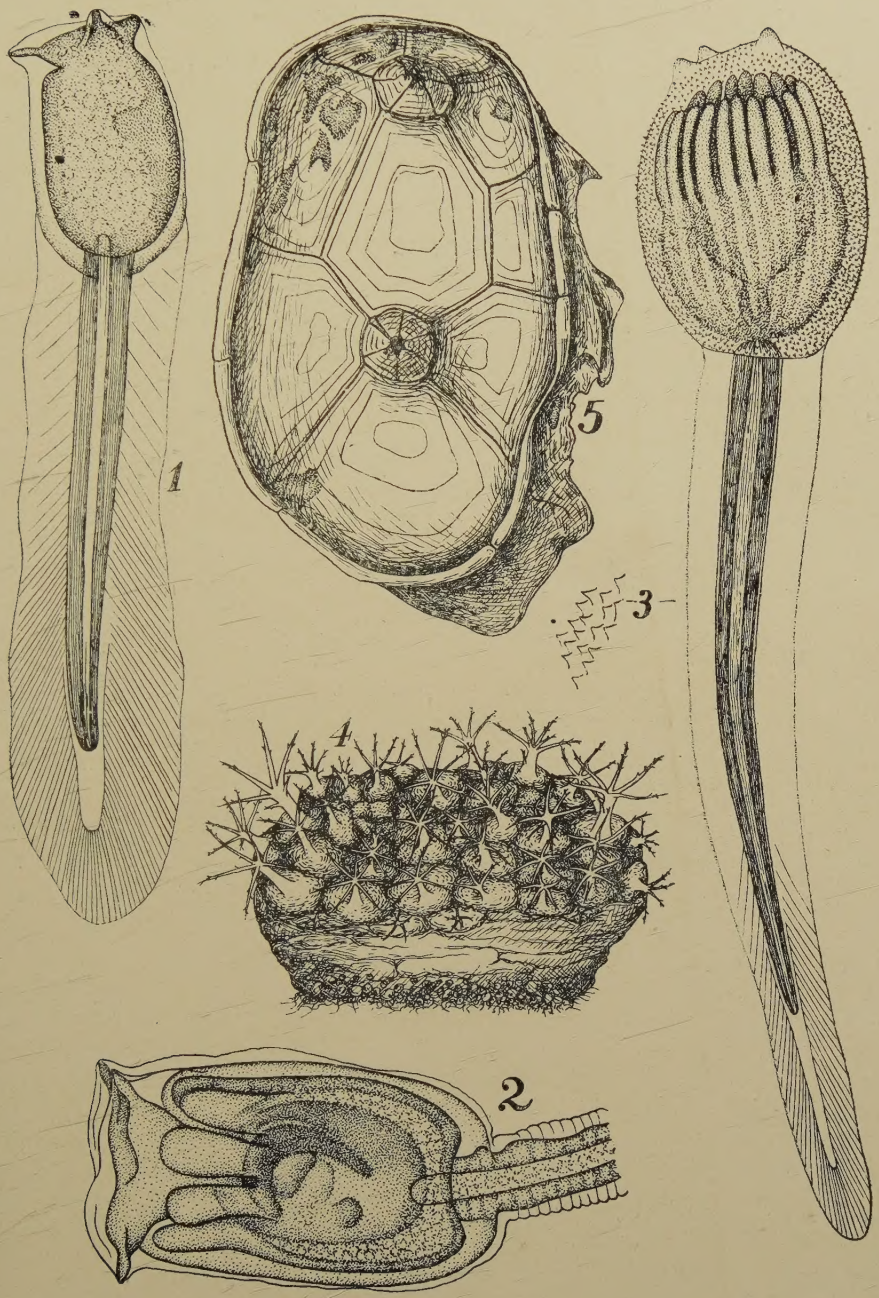
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